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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Florence R. Pon

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7590

12/29/2005

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EXAMINER

CHU, CHRIS C

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 12/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

111

Office Action Summary	Application No. 10/676,961	Applicant(s) PON ET AL.	
	Examiner Chris C. Chu	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 32 is/are pending in the application.
- 4a) Of the above claim(s) 3 - 5, 14 - 16 and 21 - 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 6 - 13, 17 - 20, 31 and 32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Request for Continued Examination

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 31, 2005 has been entered. An action on the RCE follows.

Response to Amendment

2. Applicant's amendment filed on December 5, 2005 has been received and entered in the case.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2, 12 and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- (A) In claim 2, it is unclear what applicant regards as “the upper and lower conductors are separated by a conductor distance.”
- (B) In claim 12, it is unclear what applicant regards as “the conductors are separated by a conductor distance.”
- (C) In claim 31, it is unclear what applicant regards as “the upper and lower conductors are separated by a conductor distance.”

On page 15, applicant states that the term “conductor distance” refers to a distance that is sufficiently large to separate the conductors, such as to avoid touching or crossing each other. However, this statement is still not clearly explained the term “conductor distance” because applicant used another relative terms “sufficiently large ... such as” as an explanation. Furthermore, the claims and the specification do not provide a standard for ascertaining the requisite degree of the terms, neither “sufficiently large” nor “conductor distance”. In other words, it is not clear that how much distance is the enough distance to avoid touching or crossing each other? Thus, one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Therefore, the rejection is maintained.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an

Art Unit: 2815

international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 11 – 13 and 17 – 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Hung (U. S. Pat. No. 6,476,474).

Regarding claim 11, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 a method comprising:

- stacking a plurality of dies (100 and 200) on top of one another in a staggered configuration (page 4, section 0021; defined as be stair-case) such that an upper die (200) top surface (where the bond pads are located on the die 200) in a pair of adjacent dies (100 and 200) faces downward or upward and is displaced by a first distance with respect to a lower die in the pair; and
- attaching the adjacent dies (100 and 200) by an adhesive layer (220; column 4, lines 5 – 6) between the adjacent dies (see Fig. 2F).

Regarding claim 12, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: attaching conductors (410 and 420) to bond pads (110 and 210) of the adjacent dies (100 and 200) such that the conductors are separated by a conductor distance (see e.g., Fig. 2F).

Regarding claim 13, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the plurality of dice in a first stair-case configuration in a first dimension.

Regarding claim 17, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: depositing a redistribution layer (a layer that contains the bond pads 210 and provides electrical connections between the bond pads 210 and internal elements inside

Art Unit: 2815

of the upper die 200; column 3, lines 43 – 47) to place bond pads (210) on at least one of the plurality of the dies (see e.g., Fig. 2F).

Regarding claim 18, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the dies (100 and 200) having same or “substantially” similar sizes.

Regarding claim 19, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the plurality of dies (100 and 200) on top of a substrate (330); and attaching a bottom die (100) of the plurality of dies to the substrate by an adhesive (120; column 3, line 66).

Regarding claim 20, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 attaching comprising attaching the adjacent dies (100 and 200) by the adhesive layer (220) made of a non-conductive or conductive material. Furthermore, since adhesive layer must be made of either a non-conductive or conductive material, the claimed adhesive layer is held fully met by Hung.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 2, 6 – 13, 17 – 20, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (U. S. Pat. No. 6,476,474) in view of Khandros et al. (U. S. Pat. No. 5,998,864).

Regarding claims 1 and 31, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 a method comprising:

- stacking an upper die (200) having upper top and bottom surfaces and upper first, second, third, and fourth edges on top of a lower die (100) having a lower top surface and lower first, second, third, and fourth edges such that the upper first edge is displaced from the lower first edge by a first distance, the upper first and third edges being opposite to each other, the lower first and third edges being opposite to each other, the upper bottom surface (where the bond pads are located on the die 200) facing toward the lower top surface (where the bond pads are located on the die 100); and
- attaching the upper die (200) to the lower die (100) with an adhesive layer (220; column 4, lines 5 – 6) between the upper and lower dies (see Fig. 2F); and
- attaching upper (420) and lower (410) conductors to upper (210) and lower (110) bond pads of the upper (200) and lower (100) dies at the upper and lower first edges, respectively, such that the upper and lower conductors are separated by a conductor distance (claim 31). Furthermore, the terms “top” and “bottom” die surfaces are merely relative terms, which do not patternably distinguish claimed structure over Hung.

However, Hung does not disclose a step of attaching a third die to the upper die in a stair-case configuration. Khandros et al. teaches in e.g., Fig. 4A and column 6, lines 40 – 45 a step of attaching a third die (406) on an upper die (404) such that a lower die (402), the upper die (404) and the third die (406) are stacked in a stair-case configuration (see e.g., Fig. 4A). It would have

Art Unit: 2815

been obvious to one of ordinary skill in the art at the time when the invention was made to attach the third die of Khandros et al. on the upper die of Hung as taught by Khandros et al. to increase the power and function of the semiconductor package without charge large area on the PCB and to provide an easy inventorying semiconductor devices (column 7, lines 35 – 39).

Regarding claim 2, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: attaching upper (420) and lower (410) conductors to upper (210) and lower (110) bond pads of the upper (200) and lower (100) dies at the upper and lower first edges, respectively, such that the upper and lower conductors are separated by a conductor distance.

Regarding claim 6, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: attaching the lower die (100) to a substrate (330) by a second adhesive layer (120; column 3, line 66) deposited between the lower die and the substrate (see Fig. 2F).

Regarding claim 7, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: depositing an upper redistribution layer (a layer that contains the bond pads 210 and provides electrical connections between the bond pads 210 and internal elements inside of the upper die 200; column 3, lines 43 – 47) to place bond pads (210) on the upper die (200).

Regarding claim 8, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: depositing a lower redistribution layer (a layer that contains the bond pads 110 and provides electrical connections between the bond pads 110 and internal elements inside of the lower die 100; column 3, lines 38 – 42) to place bond pads (110) on the lower die (100).

Regarding claim 9, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the upper die (200) comprising stacking the upper die (200) on top of the lower die (100), the upper and lower die having same or “substantially” similar sizes.

Regarding claim 10, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 attaching comprising attaching the upper die (200) to the lower die (100) by the first adhesive layer (220) made of a non-conductive or conductive material. Furthermore, since adhesive layer must be made of either a non-conductive or conductive material, the claimed adhesive layer is held fully met by Hung.

Regarding claim 32, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the upper die such that the upper top surface or the upper bottom surface faces the lower top surface.

Response to Arguments

9. Applicant's arguments filed on December 5, 2005 have been fully considered but they are either moot in light of the new grounds of rejection or are not persuasive.

On page 16, applicant argues that Hung does not disclose, either expressly or inherently, (1) a staggered arrangement, (2) the bottom surface of the upper die being attached to the top surface of the lower die, (3) the upper conductor and the lower conductor being separated by a conductor distance, and (4) a redistribution layer. This argument is not persuasive. Hung clearly shows in e.g., Fig. 2F (1) a staggered arrangement of two dice (100 and 200) because applicant specifically claims only two dies in the rejected claim 11, the term “staggered arrangement” in two dies is nothing more than an offset arrangement of dies. Thus, the two dies (100 and 200) of Hung fully meet the term “staggered arrangement”.

Art Unit: 2815

Furthermore, Hung clearly shows in e.g., Fig. 2F (2) the bottom surface (where the bond pads are located on the die 200) of the upper die (200) being attached to the top surface (where the bond pads are located on the die 100) of the lower die (100) because the terms “top” and “bottom” die surfaces are merely relative terms, which do not patternably distinguish claimed structure over Hung.

Furthermore, applicant specifically states in page 15 of his/her remark that the term “conductor distance” is a distance that is sufficiently large to separate the conductors. In other words, the “conductor distance” is nothing more than any distance that separates the conductors. According to applicant’s definition of the term “conductor distance”, Hung clearly shows in e.g., Fig. 2F that the upper conductor (420) and the lower (410) conductor being separated by a conductor distance (the distance from the one side of the adhesive layer 220 to the other side of the adhesive layer 220).

Finally, Hung discloses in e.g., Fig. 2F and column 3, lines 38 – 42 a redistribution layer (a layer that contains the bond pads 110 and provides electrical connections between the bond pads 110 and internal elements inside of the lower die 100; Hsuan et al., cited herein for evidence purpose, clearly shows in Fig. 3 and column 3, lines 23 – 25 the circuit layer of Hung does in fact read as the redistribution layer). Inherently, the circuit surfaces (100a and 200a) in the upper (200) and lower (100) dice contains a circuit layer that provides electrical connections between the bond pads (110 and 210) and internal elements inside of the upper (200) and lower (100) die. Thus, this circuit layer of Hung read as a redistribution layer.

For the above reasons, the rejection is maintained.

Art Unit: 2815

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu
Examiner
Art Unit 2815

c.c.
Thursday, December 22, 2005


SPE Kenneth Parker
TC2800